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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
DIAMOND, ALAN D	

ART UNIT	PAPER NUMBER
1753	

DATE MAILED: 10/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/645,747	MCFARLAND, ERIC W.	
	Examiner	Art Unit	
	Alan Diamond	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 August 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *See Continuation Sheet* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5,7,8,13-19,21,23,25,31,33-37,42,47,50-56,59 and 97-101* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 August 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Continuation of Disposition of Claims: Claims pending in the application are 1-3, 5, 7, 8, 13-19, 21, 23, 25, 31, 33-37, 42, 47, 50-56, 59, and 97-101.

DETAILED ACTION

Comments

1. The photogalvanic device of Chen (U.S. 4,076,904) cannot have ballistic transport from the photoactive thin film (12) to the photoactive thin film (20) because there is an electrical insulator (16) that insulates electrode (14) from counterelectrode (18). As clearly seen in Figures 1 and 2, electrons flow through leads (22,24), and this is not ballistic transport. There are no electrons flowing through the electrical insulator (16). The situation in Chen is different from the metal-insulator-semiconductor junction, or the charge separation layer that has insulator in, for example, instant claims 21 and 25.

Specification

2. The disclosure is objected to because of the following informalities: On page 1, at the continuity data inserted before the first line, the term "now U.S. Patent 6,774,300" should be inserted after "January 25, 2002,". On page 1, at the continuity date inserted before the first line, the term ", now pending" should be deleted. Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 8, 15, 17, and 55 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 8 is indefinite because "the light energy conversion layers" at line 2 lack positive antecedent support in claim 1.

In claim 15 bridging lines 2 and 3, in claim 25 bridging lines 2 and 3, in claim 36 at line 3, and in claim 37 bridging lines 2 and 3, the term "from the group comprising" is improper Markush language and should be changed to "from the group consisting of".

In claim 17, at line 2, the term "substantially transparent" is indefinite because it is subjective. It is suggested that "substantially" be deleted from said term,.

In claim 55, at line 2, the term "predetermined type" is indefinite because it its subjective. It is suggested that "predetermined" be deleted from said term.

Claim 55 is indefinite because it is not clear which layer is being referred to by the term "the conducting layer" at lines 3-4.

Claim Rejections - 35 USC § 102/103

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

> the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-3, 5, 13-15, 17, 19, 23, 31, 35, 36, 42, 50, 51, 53, 56, 97, 98, 100, and 101 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Skotheim, U.S. Patent 4,442,185.

As seen in Figures 13 and 14, Skotheim '185 teaches a photoelectric device comprising a layer of n-type semiconductor (131) which reads on the instant light energy conversion layer; a 5-50 angstrom platinum layer (135); a highly conductive layer (134) of polymer blend (i.e., non-metal); and a p-type semiconductor layer (132), such as silicon, or germanium, etc, which reads on the instant charge separation layer (see also col. 15, lines 33-64; and col. 17, line 25). It is the Examiner's position that either said platinum layer (135), or said highly conductive layer (134), or the combination of the platinum layer (135) and highly conductive layer (134), reads on the conducting layer in claim 1, on the front contact layer in claim 31, an on the front conducting layer in claim 97, and inherently provides ballistic transport of charge carriers from the n-type semiconductor layer (131) to the p-type semiconductor layer (132). The back contact layer on the right side of p-type semiconductor layer (132) can be a metal, and it is the Examiner's position that said back contact is an ohmic contact (see col. 16, lines 19-29). As seen, for example, in layer 72 in Figure 7, layer 82 in Figure 8, and the lightly doped n layer in Figure 10, it is the Examiner's position that charge carriers will be in the form of photon excited electrons e^- and holes h^+, as per instant claims 2 and 3.

With respect to claims 17 and 53, it is the Examiner's position that said 5-50 angstrom platinum layer (135) and/or said highly conductive layer (134) of polymer blend is inherently transparent.

With respect to claim 19, it is the Examiner's position that said platinum layer (135), or said highly conductive layer (134), or the combination of the platinum layer (135) and highly conductive layer (134), inherently forms a tunnel junction with the p-type semiconductor layer (132).

With respect to claim 98, it is the Examiner's position that the n-type semiconductor (131), formed of photoexcitable silicon (i.e., instant photoexcitable molecular species), or germanium etc, enables charge carriers to be ballistically transported from said n-type semiconductor layer (131) to said p-type semiconductor layer (132).

Since Skotheim teaches the limitations of the instant claims, the reference is deemed to be anticipatory.

In addition, the presently claimed limitation that the conducting layer (front contact; front conducting layer) provides ballistic transport of charge carriers from the light energy conversion layer to the charge separation layer, and the requirements of a tunnel junction, ohmic contact, transparency, photon excited electrons e^- and holes h^+, and photoexcitable molecular species would obviously have been present once Skotheim '185's photovoltaic device is provided. Note In re Best, 195 USPQ at 433, footnote 4 (CCPA 1977) as to the providing of this rejection under 35 USC 103 in addition to the rejection made above under 35 USC 102.

8. Claims 1-3, 5, 7, 8, 14, 15, 17-19, 23, 25, 31, 34, 35, 37, 42, 47, 51, 53, 54, 56, 59, 97-101 are rejected under 35 U.S.C. 102(e) as being anticipated by Han, U.S. Patent U.S. 6,150,605.

Han teaches a photovoltaic cell comprising a porous photovoltaic layer (3) that reads on the instant light energy conversion layer; an electrically conductive film (5) that, it is the Examiner's position, reads on the instant conducting layer, front contact, or front conducting layer, and that can be made from, for example, a hole-transporting material such as polyvinylcarbazole or an electrically conductive polymer (electron transporter) such as polypyrrole; and a second porous photovoltaic layer (7) that reads on the instant charge separation layer; wherein one of the first and second photovoltaic layers is n-type semiconductor and the other is p-type semiconductor (see col. 2, line 48 through col. 3, line 31; the paragraph bridging cols. 5 and 6; and Figure 1). Note that the device also has a back electrode (8), which, it is the Examiner's position, is an ohmic contact (see Figure 1; and col. 5, line 66). It is the Examiner's position that said electrically conducting film (5) inherently provides ballistic transport of charge carriers (holes or electrons) from photovoltaic layer (3) to photovoltaic layer (7).

With respect to claim 7, mixtures of semiconductor particles can be used in both photovoltaic layers (3) and (7), and thus there can be a "plurality of photosensitive structures" (see col. 3, line 20).

With respect to claims 8 and 47, and as seen in Figure 1, the photovoltaic layer (3) is embedded in the conductive layer (5).

With respect to claims 17 and 53, it is the Examiner's position that the polyvinylcarbazole or polypyrrole electrically conductive layer is inherently transparent.

With respect to claim 19, it is the Examiner's position that Han's conductive layer (5) and the photovoltaic layer (7) inherently form a tunnel junction.

With respect to claims 18, 34, and 54, it is the Examiner's position that Han's semiconductor layer (3) and conductive layer (5) inherently for a Schottky barrier, with one functioning as p-type and the other functioning as n-type depending on the materials that are selected.

With respect to claim 23 and 56, both photovoltaic layers (3,7) can be made from inorganic semiconductors (see col. 3, lines 3-20).

With respect to claims 25 and 59, the charge separation layer can be considered to be the combination of layers (7,8,9) which has glass (insulator) substrate (9) deposited on metal (8) and semiconductor (7) (see col. 2, lines 53-64; col. 3, lines 3-20; and Figure 1).

With respect to claim 31, it is the Examiner's position that Han's electrically conductive film (5) inherently it "ultra-thin", particular in view of the fact that electrons and holes move to the respective semiconductor films (3,7) via said transparent electrically conductive layer (5) (see col. 6, lines 1-4).

With respect to claim 37, note that the semiconductor for the layers (3,7) can be titanium oxide (i.e., dioxide), tungsten oxide, etc (see col. 3, lines 12-21).

With respect to claim 41, note that the semiconductor layers (3,7) can have a thickness of 0.3 to 50 microns (see col. 3, lines 39-41).

With respect to claim 98, there is a photoexcitable colorant (4) deposited on the electrically conductive layer (5), which, it is the Examiner's position, enables said ballistic transport (see Figure 1; and col. 4, lines 6-59).

With respect to claim 99, electrically conductive layer (5) also has semiconductor layer (3) on its surface, and said semiconductor layer (3) is formed from nanoparticles, which read on the instant nanostructures (see col. 3, lines 43-52; and col. 6, line 27).

Since Han teaches the limitations of the instant claims, the reference is deemed to be anticipatory.

In addition, the presently claimed limitation that the conducting layer (front contact; front conducting layer) provides ballistic transport of charge carriers from the light energy conversion layer to the charge separation layer, and the requirements of a tunnel junction, ohmic contact, transparency, photon excited electrons e^- and holes h^+, and Schottky barrier would obviously have been present once Han's' photovoltaic device is provided. Note In re Best, 195 USPQ at 433, footnote 4 (CCPA 1977) as to the providing of this rejection under 35 USC 103 in addition to the rejection made above under 35 USC 102.

Claim Rejections - 35 USC § 103

9. Claims 16 and 52 rejected under 35 U.S.C. 103(a) as being unpatentable over Han (U.S. Patent US 6,150,605) in view of Coleman (U.S. Patent 5,413,739).

Han teaches a photovoltaic cell comprising a porous photovoltaic layer (3) that reads on the instant light energy conversion layer; an electrically conductive film (5) that, it is the Examiner's position, corresponds the instant conducting layer or front

contact and that can be made from, for example, an electrically conductive polymer such as polypyrrole; and a second porous photovoltaic layer (7) that reads on the instant charge separation layer; wherein one of the first and second photovoltaic layers is n-type semiconductor and the other is p-type semiconductor (see col. 2, line 48 through col. 3, line 31; the paragraph bridging cols. 5 and 6; and Figure 1). Note that the device also has a back electrode (8), which, it is the Examiner's position, is an ohmic contact (see Figure 1; and col. 5, line 66). It is the Examiner's position that said electrically conducting film (5) inherently provides ballistic transport of charge carriers (holes or electrons) from photovoltaic layer (3) to photovoltaic layer (7). Han teaches the limitations of the instant claims other than the difference which is discussed below.

Han does not specifically teach that its electrically conductive film (5) can be a metal oxide. Coleman teaches what is very well known that ITO is a conductive material that can be substituted for polypyrrole (see col. 2, lines 58-65). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used ITO as the conductive material for Han's conductive film (5) because, as shown by Coleman, ITO is electrically conductive and can be substituted for a conductive material such as polypyrrole. As noted above, Han discloses polypyrrole as an example of its electrically conductive material.

Double Patenting

10. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA

1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

11. Claims 1-3, 5, 7, 8, 13-19, 21, 23, 25, 31, 33-37, 42, 47, 50-56, 59, and 97-101 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-60 of U.S. Patent No. 6,774,300. Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims of said patent anticipate the instant claims but are of a different scope than the instant claims. Said patent claims are of a different scope because they require, for example, the combination of a Schottky barrier and a conducting layer that is an ultra-thin metal film.

12. Claims 1-3, 5, 7, 8, 13-19, 21, 23, 25, 31, 33-37, 42, 47, 50-56, 59, and 97-101 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 97-128 of copending Application No. 10/750,015. Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims of said copending application anticipate the instant claims but are of a different scope than the instant claims. Said copending application claims are of a different scope because they require, for example, the combination of a Schottky barrier and a conducting layer that is an ultra-thin metal film.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Response to Arguments

13. Applicant's arguments filed August 20, 2003 have been fully considered but they are not persuasive.

Applicant argues that the instant independent claims now recite that either the conducting layer (claim 1) or the front contact layer (claim 31) ballistically transports electrical energy from the light energy conversion layer to the charge separation layer which eliminates the need for an electrolyte when producing electrical power from light that impinges upon the light energy conversion layer. However, this argument is not deemed to be persuasive for several reasons. Firstly, as noted above, it is the Examiner's position that Skotheim '185's platinum layer (135), or highly conductive layer (134), or the combination of the platinum layer (135) and highly conductive layer (134), reads on the conducting layer in claim 1, on the front contact layer in claim 31, and on the front conducting layer in claim 97, and inherently provides ballistic transport of charge carriers from the n-type semiconductor layer (131) to the p-type semiconductor layer (132). While it is true that Skotheim '185's device contains a polymer electrolyte, the instant recitation of eliminating the need for an electrolyte when producing electrical power from light that impinges upon the light energy conversion layer does not exclude the presence of Skotheim '185's polymer. The need for an electrolyte may be eliminated, but the electrolyte can still be present. The same holds true for instant claim

97. In claim 97, the need for an electrolyte may be eliminated, but the electrolyte can still be present.

Applicant notes that claim 98 recites a front conducting electrode that has photoexcitable molecular species. However, this is not deemed to be persuasive because, as noted above, it is the Examiner's position that Skotheim '185's n-type semiconductor (131), formed of photoexitable silicon (i.e., instant photoexcitable molecular species), or germanium, etc, enables charge carriers to be ballistically transported from the n-type semiconductor layer (131) to the p-type semiconductor layer (132).

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alan Diamond whose telephone number is 571-272-1338. The examiner can normally be reached on Monday through Friday, 5:30 a.m. to 2:00 p.m. ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Alan Diamond
Primary Examiner
Art Unit 1753

Alan Diamond
October 8, 2004